

# PATENT SPECIFICATION

DRAWINGS ATTACHED

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## COMPLETE SPECIFICATION

### Improvements in or relating to Cardiac Stimulators

We, CHIRANA, ZAVODY ZDRAVOTNICKÉJ TECHNIKY, ODBOROVY PODNIK, a Czechoslovakian Body Corporate of Stara Tura, Czechoslovakia, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a cardiac stimulator for implantation in the human body, and having an electrode forming part of the surface of the apparatus for connection with one of the terminals of a pulse generating means.

The cardiac stimulator is a generator of electrical pulses used for the control of the heart function during heavy anomalies of the heart rhythm. This very small generator with batteries is provided within an envelope made of material compatible with the environment of the human body to permit its implantation and permanent location therein. A first output terminal of the pulse generator, the stimulating terminal, is connected by an electrical conductor to a first electrode implemented in the myocardium. A second output terminal of said pulse generator is connected in the unipolar stimulation method, to the tissue of the front abdominal wall near the implanted apparatus by a second electrode. For effecting this latter connection the present cardiac stimulators use a conductor several centimetres in length which is connected by one end to the apparatus and the other end is stitched to human tissue. With this arrangement breaking-off from the apparatus, and interruption and disconnection from the human tissue occurs. According to another arrangement the connection of the conductor or leads with the tissue is effected in that the second electrode forms a part of the surface of the apparatus and dur-

ing the implantation period permanently contacts the tissue. Such a second electrode used to take the form of a wire loop located on the apparatus periphery. With such an arrangement provided with a small electrode surface of less than 1 square centimetre, a considerable current density appears at the electrode-tissue junction.

For this reason undesirable tissue stimulation can be evoked near the location of the apparatus in the human body. The electrode of other known apparatus used to be designed in the form of a plane metal plate located on the surface of the apparatus. Long term reliable conductive connection is not obtained with this type of apparatus because of the flesh envelope formed by the organism around the implanted apparatus.

According to the invention there is provided a cardiac stimulator for implantation into the human body having a first electrode for fixing to the myocardium and a second electrode forming an integral part of the side wall and of the bottom of the stimulator, this second electrode having the shape of a tape and being located such as to pass from the side wall to the bottom over one common edge formed by said side wall and the bottom of the stimulator.

In our copending British Patent Application No. 12647/67 (Serial No. 1,161,578) we describe and claim a cardiac stimulator for implantation in the human body, wherein a channel receiving an electrical conductor opens into a recess in the envelope of the stimulator, whereby the conductor can be looped about the envelope without forming a sharp bend.

An embodiment of a cardiac stimulator in accordance with the invention will be now described by way of example with reference to the accompanying drawing, wherein:

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Figure 1 shows the front view of the cardiac stimulator and

Figure 2 a view from below of said cardiac stimulator.

- 5 The cardiac stimulator consists of an apparatus contained in an envelope 1 made of material compatible with the environment of the human body to permit its implantation therein, said apparatus comprising first and second electrodes, said second electrode 2 located according to the drawing and forming a part of the apparatus. Said second electrode 2 passes on the bottom part of the cardiac stimulator over the edge into the bottom of the envelope 1. The screws 4 secure the fixation of the electrical conductor (not illustrated) of the first or stimulation electrode in the channel 5. The second electrode 2 is elongate with a width of 15 mm, which forms a part of the flat side wall of the envelope and passes over its bottom edge. The total surface of this electrode is preferably at least 5 square centimetres.

- 25 This embodiment of the invention obtains on the one hand a reliable connection of the second electrode 2, by passing the electrode over the edge of the stimulator to connect, with the human tissue, and on the other hand has with regard to its elongate form a low

current density which is less than the stimulation threshold of human tissue. 30

Mechanical failure, for example the break-off of the electrical conductor which, in known stimulators, connects the second electrode with the tissue, is eliminated by this design. 35

#### WHAT WE CLAIM IS:—

1. A cardiac stimulator for implantation into the human body having a first electrode for fixing to the myocardium and a second electrode forming an integral part of the side wall and of the bottom of the stimulator, this second electrode having the shape of a tape and being located such as to pass from the side wall to the bottom over one common edge formed by said side wall and the bottom of the stimulator. 40 45

2. A cardiac stimulator substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing. 50

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of  
the Original on a reduced scale*

